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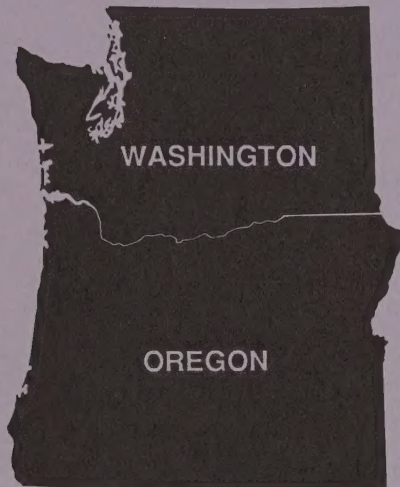
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Forest Pest Management



DIPEL 6AF
Spray Trials
Yuba City Airport,
California
December, 1989



Striving for a healthy forest.

United States
Department of
Agriculture



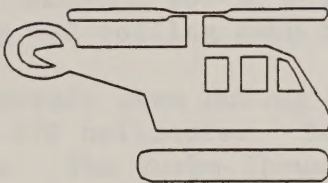
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Dipel 6AF Spray Trials

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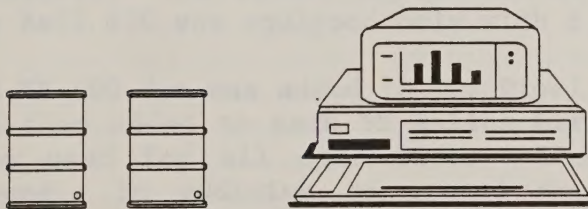


by

Tim McConnell

James S. Hadfield

April 2, 1990



Forest Pest Management
Pacific Northwest Region
USDA Forest Service

INTRODUCTION

Objective: Observe the handling requirements and characteristics of Dipel 6AF sprayed through conventional helicopter and fixed wing spraying systems to determine if it can be used operationally for western spruce budworm suppression projects in Region Six.

Criteria for operational qualification:

1. Product does not clog components of the aircraft spraying systems more than comparable B.t. formulations.
2. Cavitation does not stop or cause unacceptable hinderance or product flow.
3. Consistency of the product is uniform and solids do not settle within 24 hours of agitation.
4. Droplets are not deposited as "dry" spheres on deposit cards.
5. Product can be atomized to VMD within the range of 90 to 150 microns.

The spray trials took place at the Yuba City Airport on November 30 and December 1, 1989. Russell Stocker, the contractor, provided the aircraft and facilities.

An additional interest was to observe the operational use of SwathKit developed by Jon Bryant for the USDA Forest Service Northeast Area State and Private Forestry. Functions of SwathKit observed included; weather monitoring, reading spray cards and data analysis.

METHODS AND MATERIALS

Abbott Laboratories provided 165 gallons of Dipel 6AF. The material was used at a rate of 1/3 gallon per acre. The three 55 gallon barrels had been sitting at the airport for a week prior to use. The only aggitation used prior to loading was rolling each barrel on its side for 3 to 4 minutes.

The aircraft used during the trials was a Turbo Thrush with extended wings and a Bell 47G helicopter. Both were equipped with standard spray systems built by Simplex. The Turbo Thrush was first equipped with 6 Micronair AU 5000 rotary atomizers. The second day it was equipped with 8 Beecomist rotary atomizers. The Bell 47G was equipped only with 6 Beecomist rotary atomizers.

Red XB-400 dye was added to the Dipel 6AF first by mixing the powder with water and then added to each 55 gallon barrel. White Kromekote spray cards (3"x5") were used for all card lines. They were placed in plastic frames on the ground. In addition to ground cards, the B3 card line also had smaller Kromekote cards on 18" stands above the ground.

The SwathKit was available to monitor meteorological conditions (wind speed, direction, relative humidity and temperature) on the second day of trials only. At least one card line from each aircraft configuration was read using SwathKit's image analyzer. The use of SwathKit was demonstrated by Karl Mierzejewski of the Northeast Forest Aerial Application Technology Group (NEFAAT), Pennsylvania State University.

Calibration was done on each aircraft configuration just prior to the spray trials. Both aircraft had Crop Hawk flow meters with a #2 orifice. In line

strainer were 50 mesh. Nine spray trails were conducted during the two days. The Turbo Thrush with Micronair AU 5000s was first (T1-T3) mid morning. The Bell 47G with Beecomists (B1-B3) was second late morning. Late morning of the second day, the Turbo Thrush with Beecomists (A1-A3) was the third configuration. Each configuration received three spray runs.

Weather conditions varied from ideal to dry during the trials. The close proximity to the main runway required that the aircraft fly parallel to the runway. This limited the aircraft ability to fly directly into the wind when flying over the card lines.

RESULTS AND DISCUSSION

After each aircraft configuration spray trial was completed, all inline screens and filters were inspected for particulates. The aircraft tanks and Dipel 6AF barrels were also checked. No debris, particulates or other sediments were found. The product did not clog any components of the aircraft spraying system. Cavitation did not occur during calibration or during spray trials. A hydraulic pump was used in each spray system without any problems. Boom pressure was easily maintained during the trials.

Spray droplets were not deposited as "dry" spheres on the deposit cards. Because the material does not spread like water on the spray cards, it is important to insure that the droplets are not smeared on the cards during collection and other handling.

Six cards sets were analyzed by SwathKit for drops per square centimeter, VMD and IU per square centimeter. Average VMD's ranged from 88 to 170 microns. The largest VMD's came from the configuration with eight Beecomists on the Turbo Thrush. Drops per square centimeter for the entire card line ranged from 8.6 to 17.8 on the ground cards. International units (IU) per square centimeter ranged from 38 to 237. Ground card (3"x5") deposit compared to cards (3"x2") on 18" stands above the ground for trial B3 showed significantly less deposit on stand cards when measuring IU and drops per square centimeter, but stand cards had larger VMD.

Most of the spray cards were read with the SwathKit a week after the trials in Portland, Oregon. The SwathKit and image analyzer were used by Tim McConnell with only a brief introduction to the program. The image analyzer board in the PC had a minor problem, so not all cards were read and analyzed. The SwathKit demonstrated accuracy and ease in spray card reading. Measurement averages are of the entire card line, not just the effective swath width. Streaked or smeared droplets will be read as larger VMDs because of the increased surface area of the strain. No analytical processes other than deposit averages for card line was done with the SwathKit after this trial. Card line B2 was reas twice using SwathKit. Both reading demonstrated similar results.

Forest Service personnel assisting during the calibration and characterization phases included; Julie Weatherby and Andy Knapp from Forest Pest Management, Intermountain Region and Pat Skyler and Jack Barry from Forest Pest Management, Washington Office, Davis, California. Gary Melchior and Frank Hewitt were on site representing Abbott Laboratories.

File Name	B47B-2	B47B-2A	YUBAH4	YUBAH3	TTB-1	TTM-3
Card Code	B2	B2	B3	B3	A1	T3
Ave IU/CM2	56.4	37.8	57.8	19.0	237.6	48.7
Ave Drops/CM2	10.5	8.6	14.5	3.4	17.8	9.1
Ave VMD	116.1	108.3	87.8	110.7	170.2	113.1
Aircraft	Bell 47G	Bell 47G	Bell 47G	Bell 47G	TurboThrush	TurboThrush
Nozzle	6 Beecomist	6 Beecomist	6 Beecomist	6 Beecomist	8 Beecomist	6 Micronair
MPH	57	57	60	60	141	134
Total GPM	3.6	3.6	3.6	3.6	16.0	15.0
PSI	25	25	25	25	30	40
Orifice	D5	D5	D5	D5	D6	--
Release Height	50'	50'	50'	50'	35'	50'
Card Location	ground	ground	ground	18" above	ground	ground
Card Size	3"x5"	3"x5"	3"x5"	2cm x4 cm	3"x5"	3"x5"
Outboard Nozzle % of Wing	51	51	51	51	69	71

NOTES:

B47B-2 = Late afternoon conditions, just below 50% RH. Second pass.

B47B-2A = Same second pass. Cards were read a second time for comparison.

YUBAH4 = Third pass and final pass of day. Excellent conditions for spray trials. Cards were read during demonstration of SwathKit inside hanger.

YUBAH3 = Same pass as YUBAH4, but these were much smaller cards a stands 18 inches above the ground cards. These cards were measured by Karl Mierzejewski. Note the low drops/cm2 and the higher VMD than the ground cards.

TTB-1 = First pass of three on the second morning. Larger drops and higher volumes can be partially attributed to the aircraft release height of 35 feet. Only cards 0-16 were read.

RECOMMENDATIONS

Dipel 6AF

The new formula Dipel 6AF should be considered for operational use for suppression of western spruce budworm. The material handled as well as any other aqueous *Bacillus thuringiensis* used to date. The spray trials were to observe the handling characteristics of the material, not to perform exact spray pattern characteristics. Volume Median Diameters of the material was determined to be well within the appropriate range.

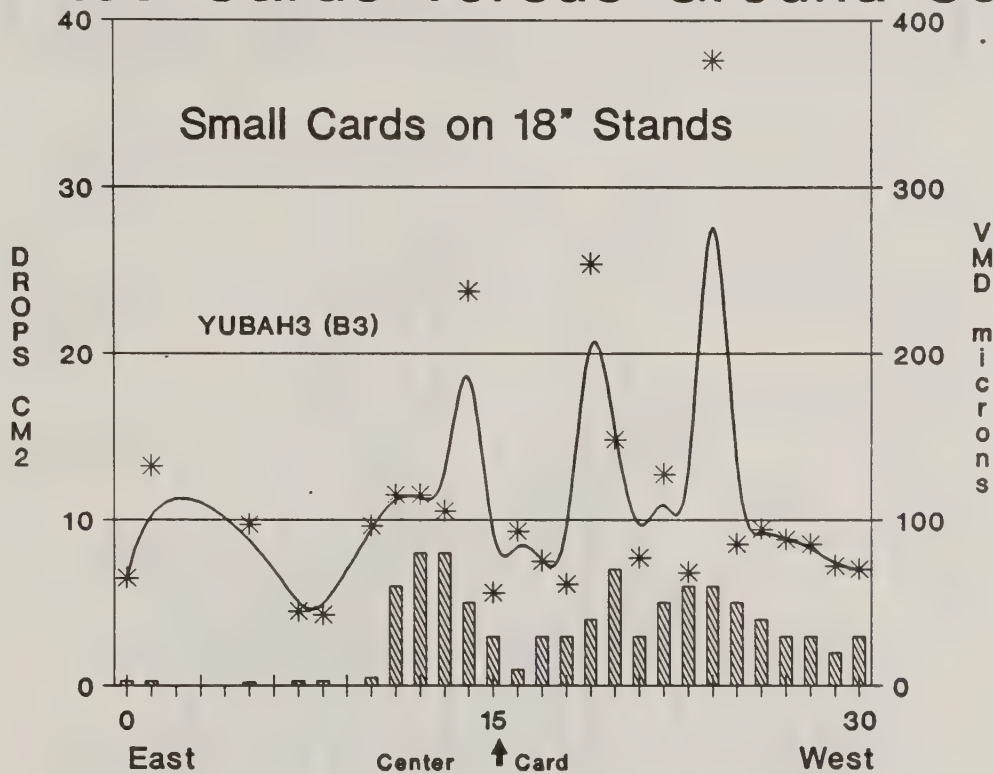
SwathKit

Time spent reading and analyzing spray cards and was greatly reduced using SwathKit. SwathKit is an excellent system to accurately gather meteorological data for the card line to be analyzed. Cards read by SwathKit were accurate and consistent. Consider evaluation the VMD of the effective swath width, rather than the entire set of cards read (program default). This can be done by editing card data files after the entire card line has been read. Forest Pest Management, Pacific Northwest Region will be procuring a SwathKit to be used on all aerial spray projects.

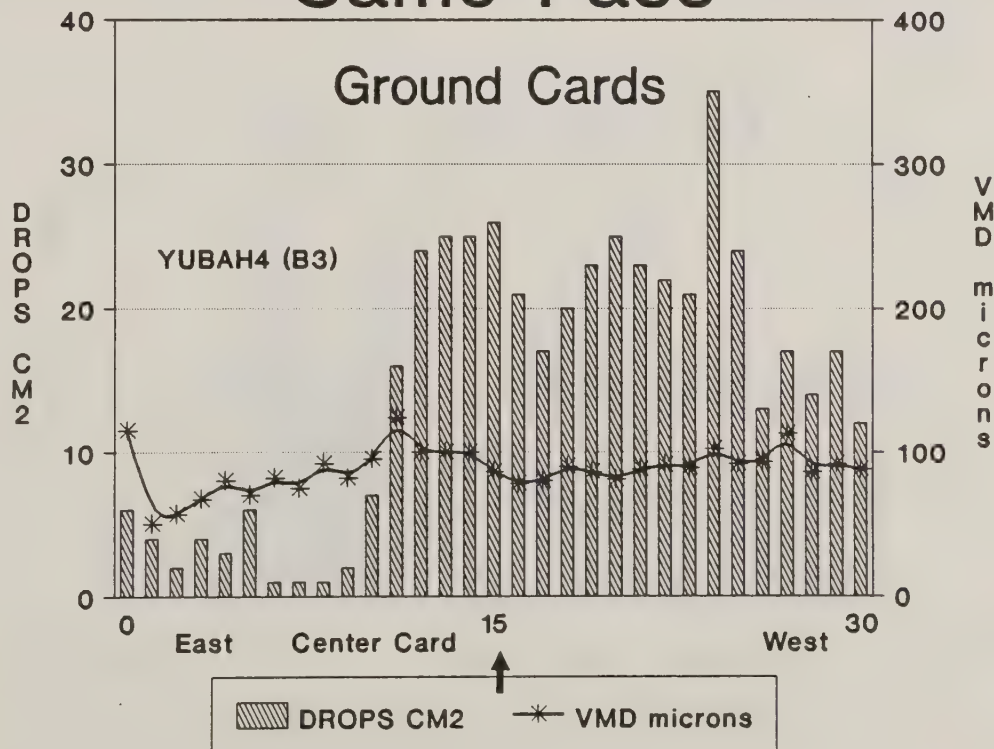
Card Line Placement

To reduce shearing effect on deposit cards, place cards (in holder) on ground. They should be away from dust, high grass and solar heated pavement.

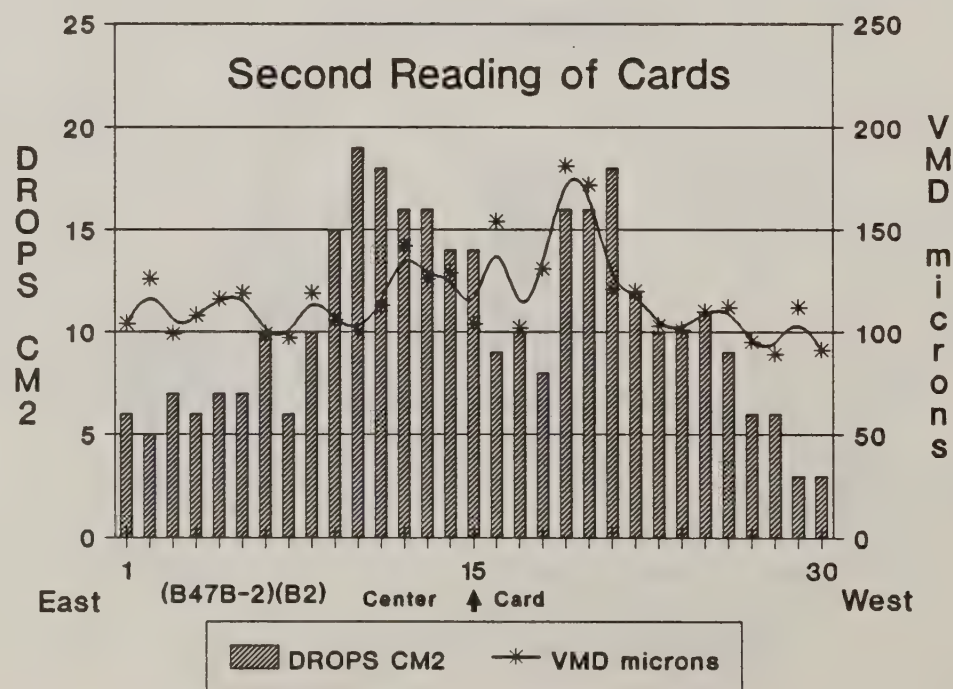
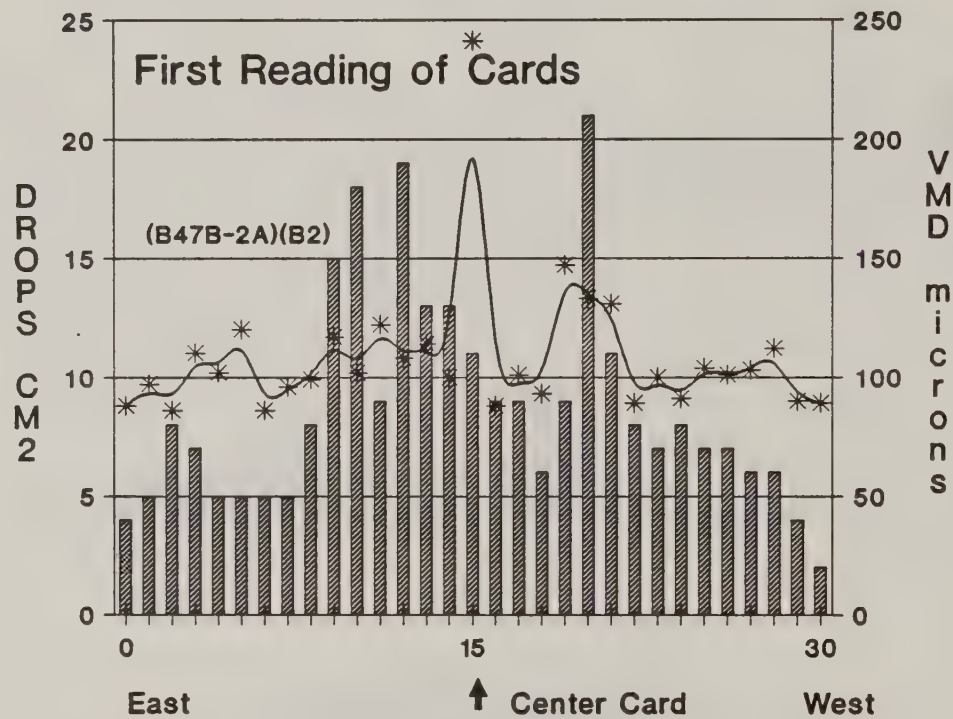
Elevated Cards versus Ground Cards

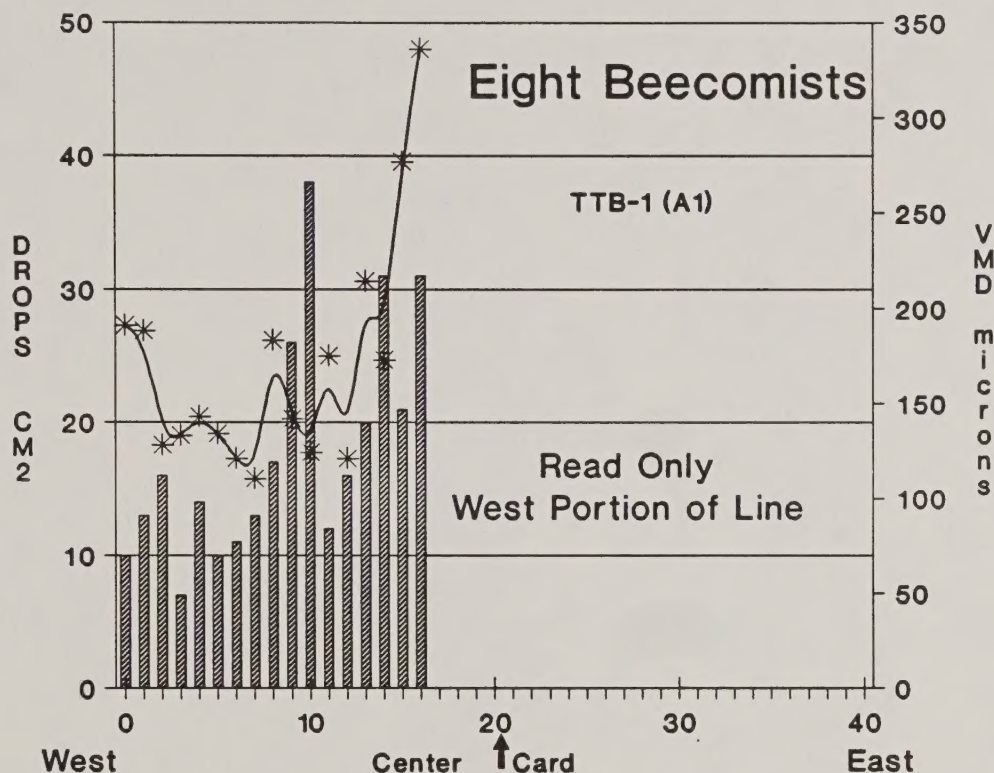


Same Pass

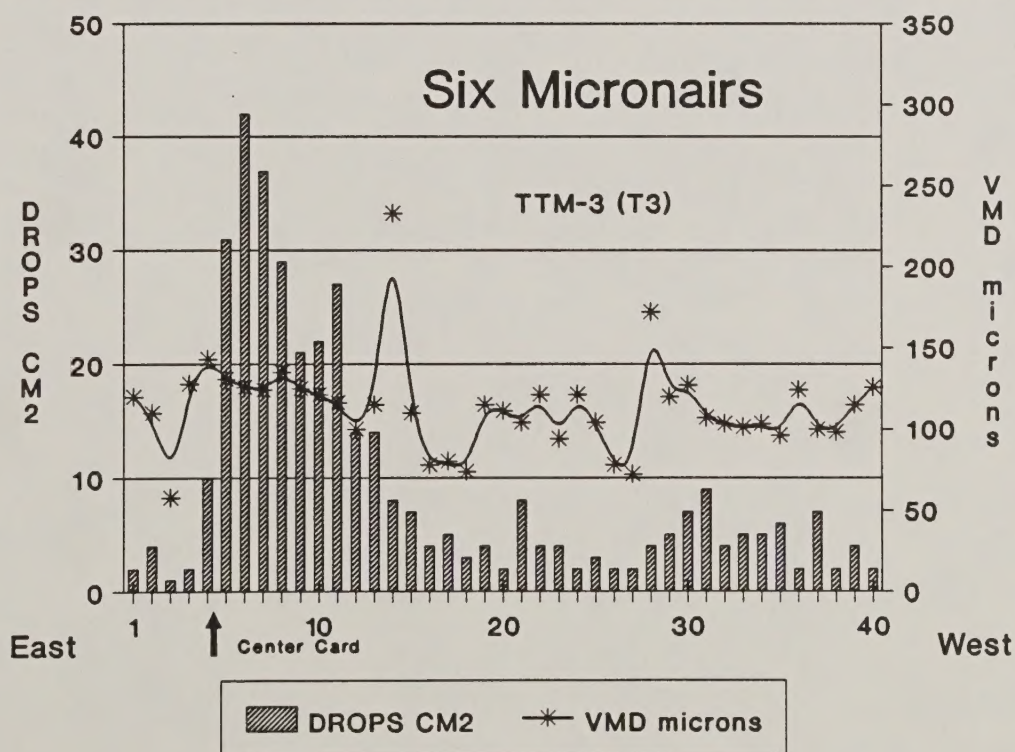


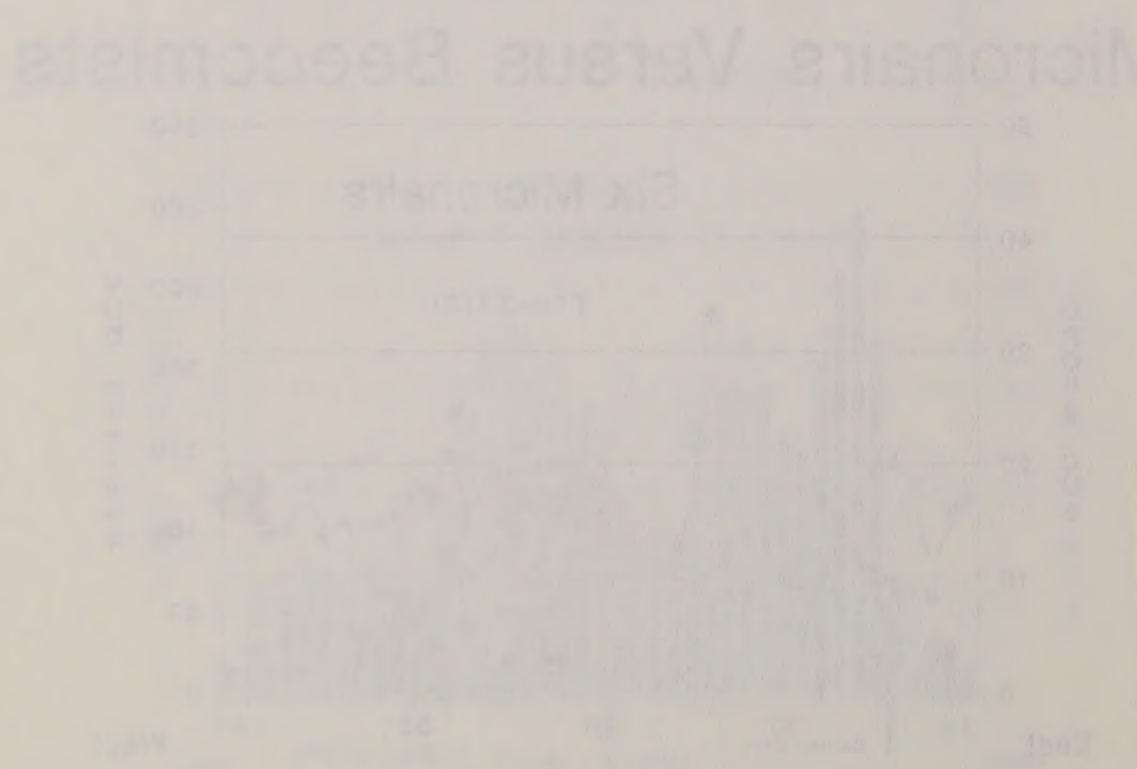
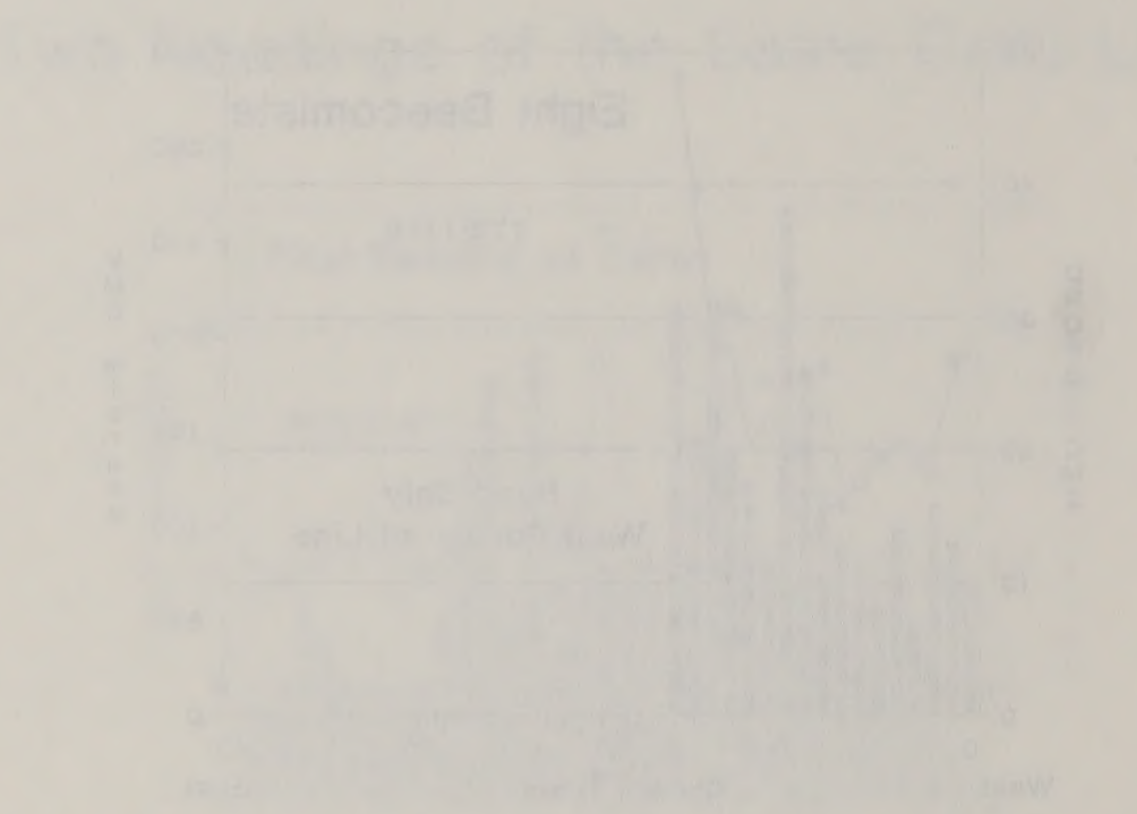
Two Readings of the Same Card Line





Micronairs Versus Beecomists





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